

### **Remarks**

In the Office Action of 1 July, 2009 claims 1-24 were pending, with no claims yet allowed. Applicant respectfully requests reconsideration for the reasons below.

### **Amendments to the Claims**

Claims 1, 9 and 17 are amended to further clarify adjusting according to certain embodiments of the invention. Support for these amendments may be found, inter alia, on page 9, lines 1-17. Minor amendments are also made to the claims for clarity. Entry is respectfully requested.

### **Double Patenting Rejection**

The Office rejects claims 1-24 on the ground of nonstatutory double patenting over claims 17-33 of co-pending Application No. 10/797513. The Office rejects claims 1-25 on the ground of nonstatutory double patenting over claims 1-25 of U.S. Patent No. 7,537,743.

Applicant notes that the amended claims are of different scope and directed to different purposes than the cited application and patent. As such, reconsideration is respectfully requested.

### **35 U.S.C. § 112 Written Description Rejections**

The Office maintains its rejection of Claims 1-24 under §112, first paragraph, for written description concerns. Because the current office action does not appear to address applicant's previous traversal of the rejection, it is unclear as to whether applicant's previous comments addressed the Office's concerns. Nonetheless, without concession and in the interests of advancing prosecution, applicant believes the claims as amended sufficiently address the Office's concerns regarding written description and reconsideration is respectfully requested.

### **35 U.S.C. § 112 Enablement Rejections**

The Office maintains its rejection of Claims 1-24 under §112, first paragraph, for allegedly failing to comply with the enablement requirement. In response to applicant's previous traversal of the enablement rejections, the Office currently contends that (1) "undue experimentation would be required", and (2) applicant's test data on page 13 "refer to the results

that can be achieved and to the effects which are not enabling as it merely informs one of the end state and not *how* it was achieved” (emphasis added).

Applicant believes the claims as currently amended sufficiently address the Office’s concerns regarding *how* to achieve the claimed result: specific parameters are listed; initial values for those parameters are based on standard operating conditions readily ascertainable to one of ordinary skill in the art; specific manipulations are described; and specific results are recited. Because of the wide variety of coals and wide variety of combustions systems, it is common practice to instruct processes generally when dealing with coal combustion. For example, see the first paragraph in the chapter on coal combustion in a classic industry reference, *Steam, Its Generation and Use*, Babcock & Wilcox (36<sup>th</sup> ed. Merchant Books 2007):

## COMBUSTION OF COAL

THE composition of coal varies over such a wide range, and the methods of firing have to be altered so greatly to suit the various coals and the innumerable types of furnaces in which they are burned, that any instructions given for the handling of different fuels must of necessity be of the most general character. For each kind of coal there is some method of firing which will give the best results for each individual set of conditions. General rules can be suggested, but the best results can be obtained only by following such methods as experience and practice show to be the best suited to the specific conditions.

As seen, it is standard practice, if not necessity, in the coal combustion industry to instruct “in the most general character”. Applicant respectfully submits that applicant’s specification, and currently amended claims, provide sufficient general instruction regarding how to achieve the claimed invention. Applicant’s use of relative terminology likely enables more types of coal combustion systems than specific values from a given plant would, because plant-specific values might only be relevant to that particular plant. Further, it is well settled that “[A] considerable amount of experimentation is permissible, if it is merely routine....” *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). The experimentation required to increase the distance between the first stage and the second stage; increase mixing within the first stage using macro-staging, reduce the mass flow; increase the volumetric utilization; increase the pressure; increase the density; increase the temperature; decrease the stoichiometric ratio; increase the local fuel flow; decrease the local air flow; and decrease micro-stage mixing is routine in the industry. As set forth in

MPEP 2164.01, "The test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue. *In re Angstadt*, 537 F.2d 498, 504, 190 USPQ 214, 219 (CCPA 1976)." Because applicant has provided guidance consistent with industry standards, and because the manipulation of parameters sufficient to achieve the claimed invention is within the skill of an ordinary person in the art, applicant respectfully requests favorable reconsideration.

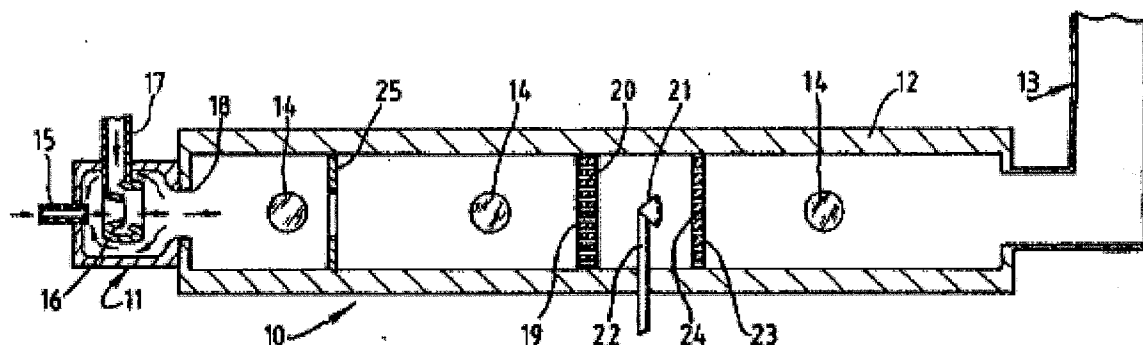
If the Office maintains the enablement rejection, applicant respectfully requests clarification regarding specifically what parameters the Office believes are necessary for enabling the invention.

### **35 U.S.C. §103 Rejections**

#### **Claims 1-24**

Claims 1-24 were rejected under 35 U.S.C. § 103 as obvious over U.S. Patent No. 4,375,949 ("Salooja") in view of U.S. Patent No. 4,029,752 ("Cahn"), and in further view of United States Patent No. 4,196,057 ("May"), United States Patent No. 5,011,516 ("Altman"), and applicant's admitted prior art. Reconsideration and allowance is respectfully requested for the reasons below.

Initially, it is important to note that, although Salooja discloses a combustion system, Salooja's system is structurally and functionally divergent from methods and systems of applicant's inventions. Salooja's Figure 1 is provided below for the Office's convenience:



The Office contends, inter alia, that Salooja discloses "actively adjusting the reducing environment such that SO<sub>3</sub> is reduced to SO<sub>2</sub> to effectuate an overall decrease in SO<sub>3</sub> concentration to achieve a desirable level of SO<sub>3</sub> (see at least col. 1, lines 54-59 and col. 7, lines

5-20 describing that the nitrogen oxides and sulfur tri-oxides are controlled to desired/predetermined levels)". Applicant respectfully requests that the Office reconsider Salooja's disclosure.

Salooja's col. 7, lines 5-20 discloses four basic operational configurations: (1) Salooja's modified combustion system without staging or the use of catalysts; (2) Salooja's modified combustion system with staging; (3) Salooja's modified combustion system with staging and with catalysts (interstage and optional first and second stages); and (4) Salooja's modified combustion system with staging, catalysts, and smoke-free operation.

Salooja's modified combustion system is illustrated in Salooja's Figure 1 above. Salooja describes the structure of its modified system in col. 4, lines 31-39:

**The internal diameter of the combustion chamber 12 is chosen to be less than the natural or unconfined maximum diameter of at least a portion of the first stage flame produced by the burner 11 so that reactive flame species which promote combustion reactions are deflected and reflected back into the first stage flame by the hot walls of the combustion chamber 12 rather than being quenched, thereby enhancing the efficiency of partial combustion of the fuel in the first stage flame.**

Salooja also describes the structure of its modified system in col. 4, lines 60-64:

**diameter of the combustion chamber 12 is chosen to be narrower than the natural or unconfined diameter of the second stage flame so as to promote efficient (part-) combustion with substantially no carbon or smoke formation even at low air/gas ratios.**

Salooja describes how the narrow construction of its system can be enhanced by baffles in col. 5, lines 8-17:

**The advantageous effects caused by confining at least part of each of the first and second stage flames by the combustion chamber so as to reduce their diameters may be enhanced by providing one or more baffles which is or are contacted by one or both of the flames. Such baffle(s) promote recirculation of reactive species in the flame(s) and thereby enhance the efficiency of the flame reactions and thereby reduce the formation of NO<sub>x</sub> and also reduce the formation of smoke and/or carbon. The or each baffle may take any form provided**

In short, Salooja's modified system is configured to narrowly confine at least part of at least one of the first or second stage flame.

Regarding operation of Salooja's modified system with staging, Salooja describes staging as involving "firing all of the fuel in the first stage with a sub-stoichiometric quantity of air" and "the injection in the second stage of sufficient air to complete combustion" (col. 1, lines 28-32).

Regarding operation of Salooja's modified system with catalysts, Salooja describes the use of catalysts "to reduce or inhibit the formation of nitrogen oxide" and discloses that Fe/Cr is the preferred catalyst out of numerous listed catalysts (col. 2, lines 3-23). Salooja describes specific catalytic configurations in more detail in col. 5, line 65 – col. 7, line 3.

Regarding operation of Salooja's modified combustion system with anti-smoke technique, it is described generally in col. 2, lines 39-68, and more specifically in col. 7, line 43 – col. 9, line 20. Based on Salooja's description, Salooja's anti-smoke technique appears to use its modified combustion chamber having specific dimensions to reduce flame cross-sectional diameter by a specific amount, 1 to 6.5 cms, and further includes the use of at least one baffle to recirculate active flame species back into the flame to promote efficient flame reactions.

As such, applicant believes that it is clear that Salooja fails to disclose or suggest *actively adjusting* the reducing environment using *at least two* of the recited methods. Salooja actually teaches away from methods based on adjustment using burner modification for improved mixing as requiring "complex and expensive subsidiary control devices" (col. 9, lines 30-48). Rather than actively adjusting any part of its system, Salooja touts the benefit of a modified chamber of narrow diameter. For at least these reasons, favorable reconsideration is requested.

Salooja does disclose that chamber length is an initial design parameter, for example, at col. 9, line 44, however, Salooja's selection of chamber length should not be confused with any of applicant's: (1) controlling SO<sub>3</sub>, (2) actively adjusting, or (3) increasing the distance between the first and second stage. In contrast, Salooja is controlling chamber length for reducing the "carbon-forming tendency" of the system (col. 10, lines 26-28).

Regarding the Office's reliance on Cahn, applicant initially notes that Cahn fails to disclose or suggest Salooja's various omissions.

Further, because of functional and structural distinctions, one of ordinary skill in the art having Salooja would have no motivation to look to the teachings of Cahn. Salooja's combustion chamber uses, inter alia, chamber design for reduction. Cahn, by way of summary: (1) first separates sulfur dioxide from flue gas (see for example col. 4, lines 54-55); and (2) then exposes the sulfur-dioxide containing stream to a separate reducing gas stream, such as an

ammonia stream (see for example col. 5, lines 23-30). Applicant respectfully submits that such a combination would result in an unusual situation where Salooja is required to separate off a sulfur-dioxide stream from its small combustions system and then expose that separated product to a reducing stream. As the Office is aware, MPEP § 2143.01(V) states “[i]f a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)” (emphasis added). “If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)” (emphasis added).

The Office’s modification of Salooja with Cahn would change Salooja’s principle of operation and further frustrate its intended purpose. For at least these reasons, applicant respectfully requests reconsideration.

#### Claims 9-16

The Office maintains its 35 U.S.C. §103 rejections of Claims 9-16 in light of the combination of Kindig, Wright, and Carver. Applicant believes the currently amended claims clearly distinguish the invention from any combination of these references.

Kindig is directed to increasing the “reaction of sulfur dioxide to sulfur trioxide” (see, for example, the Abstract showing using a specific coal, a sulfur sorbent, a sulfation propoter, and a catalyst for the reaction of sulfur dioxide to sulfur trioxide”). Applicant again respectfully notes that the portion of Kindig cited by the Office is evidently directed to using a “catalyst for the reaction of **sulfur dioxide to sulfur trioxide**”. Kindig discloses that “increased levels of sulfur trioxide are present in the combustion gas stream and are present for reaction with magnesium oxide to form magnesium sulfate”. As such, Kindig discloses using a catalyst to increase the production of the sulfur trioxide. For at least this reason, Kindig fails to disclose *at least two* of the recited *methods of actively adjusting* to reduce SO<sub>3</sub> to SO<sub>2</sub> to effectuate an overall decrease in SO<sub>3</sub> concentration, or, a decrease *to less than about 15 ppm*.

Favorable reconsideration of the instant rejection is requested.

### Claims 1-3, 8-11, 16-19 and 24

Claims 1-3, 8-11, 16-19 and 24 are rejected under 35 U.S.C. §103 as being unpatentable over Carver in view of Fan and Wright. Applicant believes the currently amended claims clearly distinguish over the Office's combination. For example, Carver's disclosure "involves mixing a sulphur sorbent together with coal" (col. 4, lines 53-54). Carver does disclose modifying combustion to use "relatively lower temperatures of combustion [to] avoid deadburing of the sorbent (complete loss of chemical activity) or hardburning (partial loss of chemical activity)" (col. 4, lines 1-4). However, missing from the reference is any form of adjusting as recited in the claims. Further, Carver teaches away from *increasing temperature*, as recited by the claims. Fan and Wright are unable to fill these voids. For at least these reasons, favorable reconsideration is requested.

Applicant also notes that one of ordinary skill in the art having Carver would have no motivation to look to the teachings of Wright. As the Office is aware, MPEP § 2143.01(V) states "[i]f proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)" (emphasis added). "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)" (emphasis added).

Applicant respectfully submits that a Carver-Wright combination would result in a self-defeating situation, where Carver is trying to decrease sulfur levels and Wright is trying to increase them. As noted above, Carver is directed to using a "sulphur sorbent" to decrease sulfur levels. Wright, in contrast, is directed to problems associated with the burning of **low-sulfur coal**, e.g., that the burning of low-sulfur foal produces a flue gas with high resistivity, which negatively effects precipitator function (col. 1, lines 33-38). Wright discloses adding a conditioning agent, e.g., sulfur, to the flue gas to achieve the desired opacity of the stack effluent (col. 4, line 61- col. 5, line 12). Wright's preferred embodiment similarly makes clear that Wright's goal of sulfur trioxide production is achieved by converting injected sulfur to sulfur dioxide with a sulfur burner, and then converting sulfur dioxide to sulfur trioxide with a sulfur dioxide conversion unit (col. 7, line 64 – col. 8, line 3). As such, the Office's modification of

Carver and Wright would be contrary to each references' intended purpose and therefore lacks the requisite motivation. For at least these reasons, applicant respectfully requests reconsideration.

Applicant respectfully notes that because applicant has addressed certain comments of the Office does not mean that applicant concedes other comments of the Office. Further, the fact that applicant has made arguments for the patentability of some claims does not mean there are not other good reasons for the patentability of those or other claims.

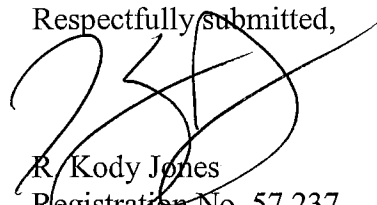
#### **Commonly Owned, Co-pending Application**

Applicant also wishes to update the Office on the status of co-pending and commonly owned United States Patent Application No. 10/797,513. A copy of the most recent Office Action is attached, and applicant's response to that action is attached.

#### **Conclusion**

By this amendment, applicant submits that he has placed the case in condition for immediate allowance and such action is respectfully requested. If the Office believes that any issue remains unresolved, applicant's attorney would welcome the opportunity for a telephone interview to expedite allowance and issue.

Respectfully submitted,



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